

YUKON RIVER SALMON TAGGING STUDIES

1968

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## YUKON RIVER TAG AND RECOVERY PROJECT, 1968

INTRODUCTION

Since 1961 salmon tag and recovery studies have been conducted on the Yukon River in order to obtain estimates of population size, percentage utilization by the commercial fishery, timing and destination of run segments, migration rates and abundance indices. During the years 1961-1967, a total of 2,270 king and 7,600 chum salmon was tagged and released.

In 1961 and 1962 tag and recovery studies utilizing Federal funds were conducted in the vicinity of Mountain Village (Mile 87) to Pilot Station (Mile 122) for the primary purpose of obtaining a population estimate of the chum salmon run. Fishwheels were used to capture chum salmon for tagging in the 1961 and 1962 study. Beginning in 1963, set gill nets were operated annually until 1967 at Flat Island located in the South Mouth for the purpose of capturing king salmon for tagging and for test fishing. In addition to gill nets, a single fishwheel was operated at Flat Island in 1965. In 1966 and 1967, kings were also tagged at the Middle Mouth. Although the tagging projects at the mouths of the Yukon River dealt mainly with king salmon, substantial numbers of chum salmon were captured incidentally and tagged.

In 1968 the Yukon River tag and recovery project was moved upriver, above the main commercial fishery, to Ohogamiut (Mile 185), Dogfish Village (Mile 227) and Paimiut (Mile 251) areas (see Map, Figure 2) because of difficulties encountered with the capture, tagging, and recovery of salmon at the mouth of the river. For example, in 1967, tagging sites were located at only the South and Middle Mouths and king salmon entering the river via the North Mouth and several channels (e.g., Kwiguk, Alakanuk, Bugomowik, etc.) were not available for tagging. Another shortcoming of the downriver tagging sites was the substantially disproportionate number of tag recoveries taken by the commercial fishery nets located at relatively close proximity to the tagging sites. This resulted in failure of the tagged fish to distribute themselves uniformly throughout the untagged population.

Chief advantages of the Ohogamiut tagging site were: (1) the location above the intensive downriver king salmon commercial fishery of sub-districts 334-10 and 334-20 (see Map, Figure 2), (2) tagging would be above confluences of all the mouths and channels of the delta, and (3) fishing effort would not be affected by storms or tidal action.



## OBJECTIVES

1. The main objective in 1968 was relocating the tag and recovery projects 185-251 miles upriver, which required transporting a vast amount of supplies and equipment by boat and chartered aircraft. In addition, since the project was located in a new area, considerable time and effort was expended toward locating adequate fishing sites and experimenting with various types of gear to capture salmon for tagging. As a result, the secondary objectives listed below were not completely attained in 1968.

2. Determine population estimate of king salmon passing through the study area (tagging-recovery sites).

3. Distinguish and determine races of king and summer chum salmon and their destinations.

4. Determine general run timing of king and summer chum salmon in study area and effects of the downriver commercial fishery on run timings and escapement into sub-district 334-30.

5. Determine migration rates of king and summer chum salmon passing through the lower Yukon area, specifically between the mouth and the tagging site and various upriver recovery sites.

## METHODS AND MATERIALS

Tagging: Various types of nets were employed to capture salmon for tagging. Mainly set gill nets of 5-1/2, 7, 8-1/2 and 9-1/2 inch mesh (stretched measure), usually of 25 fathom lengths, were fished at several different locations on both sides of the river. Some gill nets were hung using crab riser floats, which lowered the corkline of the net below the surface of the water, to test their effectiveness when there is a large amount of driftwood. In addition to set gill nets, some drift gill nets and an experimental beach seine trap were also operated. A beach seine trap is a large seine, a portion of which is anchored offshore and the remaining length trails downstream to form an "inverted L shape trap", that can be hauled to shore with the use of gas powered winches. The successful operation and location of a beach seine trap can be capable of catching large numbers of uninjured salmon for tagging and sampling purposes.

Yellow spaghetti tags, flexible plastic tubing of 1/16 inch diameter, of 13 inch lengths, were used to tag captured salmon. Each tag was inscribed with a number and the legend, "Reward ADF&G Anchorage". The tag was affixed to a stainless steel needle applicator and inserted through the flesh in the vicinity of the dorsal fin. After insertion of the tag, the needle was

removed and the two free ends of the tag were tied tightly into an overhand knot.

For each tagged fish the following information was recorded: species, sex, fork length and condition upon release. The condition of tagged fish was classified into the following general categories: Category 1 consisted of fish considered to be in good condition; Category 2 consisted of fish considered to be in fair condition; and Category 3 consisted of fish considered in questionable or poor condition. Untagged fish, dead fish or fish in very poor condition (e.g., fish bleeding from the gills were not tagged) were sampled for age-sex-size information and then were sold to local processors or given to subsistence fishermen.

Recovery: Set and drift gill nets of 5-1/2, 7 and 8-1/2 inch mesh were operated by the Department recovery crew upriver in attempts to capture tagged salmon. Also, the recovery crew periodically contacted fishermen in the Russian Mission-Holy Cross area for tag recoveries and to monitor their daily catches in order to obtain additional tagged-untagged ratios. Above the Holy Cross area, Department biologists and the subsistence survey crew collected additional tag recoveries. In the Yukon Territory, Canadian Department of Fisheries and Royal Canadian Mounted Police Personnel collected tag recoveries. A reward of \$1.00 was offered for each tag returned along with the appropriate recovery information: date and location of tag recovery.

Escapement surveys: Aerial surveys of the Andreafsky River system, located downstream from the tagging sites, were made to determine estimated numbers of salmon spawning below the tagging site.

## RESULTS

Several problems, associated with operating the tag-recovery project in the new location, were encountered that resulted in comparatively small numbers of salmon being captured at both the tagging and recovery sites. Prolonged periods of high water, large amounts of driftwood and difficulty in locating suitable fishing sites and developing adequate fishing methods severely hampered operations. The driftwood associated with high water was a particularly difficult problem and severely restricted the effective operation of the gill nets. At times, driftwood was so heavy that nets had to be pulled entirely out of the water. Even gill nets with crab riser floats were not effective in reducing the amount of driftwood in gill nets.

Considerable time and effort was expended in exploring the tagging and recovery sites for suitable set gill net sites where substantial numbers of salmon could be captured. Only a few good sites were located, usually these were commercial fishing sites that were used during closed periods and

after the commercial fishing season closed. Various methods of experimenting with set gill nets, such as modifying the type, length, depth, etc., were attempted in order to increase the catch and reduce the salmon mortality, but without success. Also drifting with gill nets and using an experimental beach seine trap were unsuccessful. The operation of the beach seine trap was hindered by the unavailability of a good site with a gravel bottom. Nearly all potential beach seine trap fishing sites that were found contained a silty bottom which was unsatisfactory for operation of this type of gear (the lead line would become buried in the river bed and, therefore, it would be very difficult to pull to shore).

As a result of the above difficulties, relatively small numbers of salmon in condition suitable for tagging were captured and, consequently, some of the objectives of the tag and recovery program were not completely obtained. It became apparent during the course of the tagging phase of the project that insufficient numbers of king salmon were being tagged to obtain a valid population estimate, the prime objective of the project. The Department recovery crew stationed at Dogfish Village, located 42 miles upstream, did not recapture any salmon tagged at Ohogamiut and, therefore, were unable to obtain a tagged-untagged ratio. The Department crew at the Dogfish Village area were unable to locate suitable fishing sites and develop adequate fishing methods. The Dogfish Village operation was transferred upriver 24 miles to Paimiut on June 30 where better fishing sites were located. Since it soon became apparent that the estimation of the population of king salmon passing through the Ohogamiut area this year was apparently not feasible, the Dogfish Village and the Paimiut projects also began to tag salmon in order to obtain additional information on other objectives of the project: viz., migration rates, timing, and distribution of run segments or races of king and summer chum salmon.

#### King Salmon

A total of 1,007 king salmon were captured at the tagging sites and 376 (37.3 %) were tagged and released (nearly all kings were captured with set gill nets while a few fish were taken with drift gill nets). In Appendix Table A the daily numbers of king salmon captured, tagged and the number of recoveries by tagging date are shown. Recoveries by tagging site nets made within 24 hours of the date of tagging are not included. Numbers of captured, tagged and recovered king salmon and the percentage tagged and recovered by tagging site is summarized below in Table 1:

Table 1. 1968 Tagging Summary - King Salmon

	Number Captured	Number Tagged	Percent Tagged	Number Recovered	Percent Recovered
Ohogamiut	607	263	43.3	76	28.9
Dogfish Village	104	36	34.6	12	33.3
Paimiut	<u>296</u>	<u>77</u>	<u>26.0</u>	<u>10</u>	<u>13.0</u>
TOTAL	1,007	376	37.3	98	26.1

For all sites combined, the overall recovery rate was 26.1 percent. Nearly all recoveries were taken with set gill nets, usually of 8-1/2 inch mesh, while a few recoveries were taken in fishwheels by upriver fishermen.

#### Distribution of Recoveries by Area of Recovery

In Table 2 the number and percentage distribution of king salmon tag recoveries by tagging site and recovery area is shown. For all tagging sites the greatest proportion of recoveries were made in the Alaskan portion of the main Yukon River, particularly in the Russian Mission-Holy Cross area where a large amount of fishing effort is located in relatively close proximity to the tagging sites. Of particular interest was the relatively large number of recoveries (10), compared to previous years, made in the Yukon Territory. This was the result of tagging above the downriver intensive commercial fishery which previously had taken a large proportion of tagged fish. The furthest upstream recovery was made at Lake Lebarge near Whitehorse, a distance of 1,715 miles upstream from the mouth.

#### Distribution of Upriver Recoveries by Tagging Date

Major Yukon River king salmon stocks are found in the Andreafsky River, which drains into the Yukon River at Mile 104, to the headwaters in the Yukon Territory, over 2,000 miles upstream. It would be expected throughout the extensive Yukon River drainage that different major spawning stocks or races would exhibit different migration times. If sufficiently large numbers of kings could be tagged in the lower portion of the Yukon River throughout the duration of the run, and if adequate recoveries were made, it seems likely that it would be possible to demonstrate whether or not differences in migration times exist for each major stock or race. If these differences in migration times could be determined, then the commercial fishery in the lower section of the Yukon River could be selectively regulated in order to insure against overharvesting of any particular stock.

TABLE 2

NUMBER AND PERCENTAGE DISTRIBUTION OF YUKON RIVER KING SALMON  
TAG RECOVERIES BY AREA, 1968

General Recovery Area <sup>1/</sup> (Mileages from mouth)	Tagging Area			Total
	Ohogamiut	Dogfish Village	Paimiut	
Ohogamiut(185)	1(1.4) <sup>2/</sup>			1(1.1)
Russian Mission(213)	12(16.9)			12(13.2)
Paimiut-Holy Cross(251-279)	22(31.0)	7(63.6)	3(33.3)	32(35.2)
Rayling(336)	1(1.4)			1(1.1)
Ulato(484)	2(2.8)	1(10.0)	1(11.1)	4(4.4)
Bishop's Mt.(512)	1(1.4)			1(1.1)
Uby(581)	4(5.6)		2(22.2)	6(6.6)
Okkrines(608)	1(1.4)		1(11.1)	2(2.2)
Tanana(695)	5(7.0)		2(22.2)	7(7.7)
Campart(763)	3(4.2)	3(27.3)		6(6.6)
Stevens Village(847)	2(2.8)			2(2.2)
Beaver(932)	1(1.4)			1(1.1)
Fort Yukon(1,002)	1(1.4)			1(1.1)
Boyle(1,213)	2(2.8)			2(2.2)
Subtotal	58(81.5)	11(100.0)	9(100.0)	78(85.8)
Taggus(881)	2(2.8)			2(2.2)
(Yukuk River)				
Subtotal	2(2.8)			2(2.2)
Mouth Goodpastor R.(1,015) (Tanana River)	1(1.4)			1(1.1)
Subtotal	1(1.4)			1(1.1)
Old Crow(1,259)	1(1.4)			1(1.1)
Dawson(1,319)	1(1.4)			1(1.1)
Mayo(1,495)	1(1.4)			1(1.1)
Carmacks(1,550)	5(7.0)			5(5.5)
Pelly Crossing(1,580)	1(1.4)			1(1.1)
Lake Lebarge(1,715)	1(1.4)			1(1.1)
Subtotal (Yukon Territory)	10(14.0)			10(11.0)
Total	71(100.0%)	11(100.0%)	9(100.0%)	91(100.0%)

<sup>1/</sup> Recoveries below tagging sites not listed.

<sup>2/</sup> Percentage recovery in parenthesis.



In Table 3 the tagging dates for king salmon recoveries made above Mile 484 are shown in relation to the number of tags. King salmon migrating past Mile 484 (Nulato) are mainly destined for the following major spawning areas: Koyukuk River, Tanana River and the upper Yukon drainage in Canada. The data indicated that the percentage of these upriver recoveries was related to the number tagged and not necessarily to the date of tagging. Previous similar analysis yielded the same conclusions (see 1967 Annual Technical Report). It is essential that comparatively large numbers of tags be applied throughout the duration of the run. If this could be accomplished, it could be possible to demonstrate conclusively whether differences in migration times occur for major spawning stocks.

#### General Run Timing

The daily catches of king salmon for the Ohogamiut, Dogfish Village and Paimiut tagging sites are shown in Appendix Table A. The first king salmon was captured on June 5 at the Ohogamiut site. The Ohogamiut and Dogfish Village tagging sites and the Paimiut subsistence daily catches are graphed in Figure 3 for comparison to the daily catches made at the Flat Island test fishing site. In general, the main peak of the king salmon run in the upriver area (Ohogamiut-Paimiut) occurred during the period June 24-26 and is probably traceable to a peak of the Flat Island daily catch occurring during June 19-22. The migration rate of these untagged fish through the Flat Island-Paimiut area, based on peak catches at various areas, was approximately 42 miles per day. Other peaks in the daily run timing upriver cannot be determined due to limitations of the Ohogamiut and Dogfish Village catch data which probably does not realistically reflect minor fluctuations in the magnitude of the run. The daily catches at these locations were influenced by driftwood and high water which resulted in a decrease in gear efficiency. In addition, fishing sites at both locations were continually changed in an attempt to increase catches.

#### Migration Rates

In Table 4 the migration rates (rate of travel or speed of migration) of tagged king salmon recovered at various points upstream are presented. The migration rate, in terms of miles per day traveled, was obtained by dividing the days out into the distance traveled. The migration rates presented in Table 4 should not be considered as the actual rate of travel due to limitations inherent in the tag and recovery data: (1) tagged fish are usually in an initially weakened or disoriented condition due to handling and tagging operation, (2) comparatively few numbers of fish were tagged and recovered, and (3) some probable inaccuracies in the reporting of the recovery date by fishermen. Migration rates of tagged fish are usually considered as the minimum rate of travel. In general, the tagging and recovery data shows that the migration rate increased as the distance traveled upstream increased. For example, the migration rates of tagged fish recovered downstream from Holy Cross were less than 20 miles per

TABLE 3

TAGGING DATES OF YUKON RIVER KING SALMON RECOVERIES  
MADE ABOVE MILE 484 DURING 1968

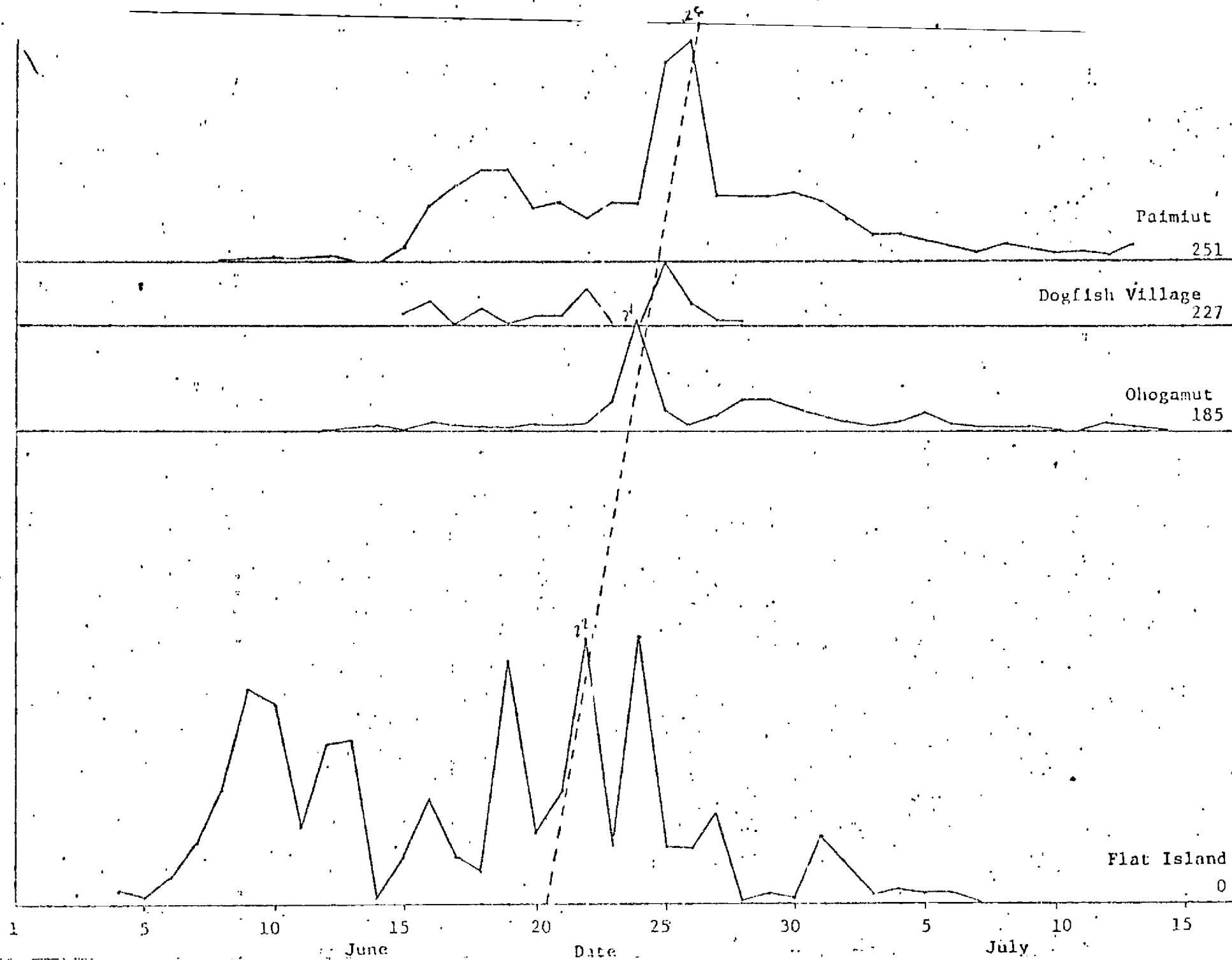
Tagging Dates	Total No. of Tags	No. of <sup>1/</sup> Recoveries	Percentage of	
			Total <sup>1/</sup> Recoveries	Total <sup>2/</sup> Tags
June 4-10	2	0	0.0	0.6 0.5
June 11-15	3	1	2.4	0.8
June 16-20	24	3	7.3	6.4
June 21-25	160	21	51.2	42.5 42.6
June 26-30	87	9	22.0	23.1
July 1-5	65	5	12.2	17.3
July 6-10	26	2	4.9	6.9
July 11-16	9	0	0.0	2.4
Totals	376	<sup>7</sup> 93 = 41(41.8%) <sup>3/</sup> 97 = 42.3	100.0%	100.0%

1/ Recoveries above Mile 484.

2/ Total tags applied at all tagging sites.

3/ Percent of total recoveries.

Daily Catches



1. 20. 1

MIGRATION RATES OF YUKON RIVER TAGGED KING SALMON BY AREA DURING 1968

Area of Recovery	Mileages from Tagging Site	No. of Recoveries	Tagging Dates (Range)	Recovery Dates (Range)	Mean Days Out	Mean Per 1
<u>OHOGAMIUT TAGGING SITE (Mile 185)</u>						
Below Ohogamiut	-	5	6/17-30	6/25-7/10	5.8	-
Ohogamiut	0	1	6/24	6/27	3.0	-
Russian Mission	25-29	12	6/7-7/1	6/10-7/10	4.8	5.1
Paimiut	66	9	6/16-7/7	6/19-7/12	4.9	13.1
Above Paimiut	74-84	11	6/13-6/28	6/14-7/2	4.8	16.1
Holy Cross	97	2	6/16-26	6/23-7/9	10.0	9.1
Grayling	151	1	6/24	6/28	4.0	37.1
Nulato	299	2	6/16-20	6/24-7/?	8.0	37.1
Bishops Mountain	327	1	6/24	7/20	26.0	12.1
Ruby	396	4	6/23-25	7/7-13	17.3	22.1
Kokrines	419	1	7/5	7/18	15.0	36.1
Tanana	510	1	6/20	7/9	19.0	26.1
Above Tanana	540	4	6/22-28	7/8-12	16.7	32.1
Rampart	578	3	6/24-26	7/14-16	20.0	28.1
Stevens Village	662	2	6/24-26	7/5-15	15.0	44.1
Below Hughes	675-784	2	6/28-30	7/14	16.0	42.1
Beaver	747	1	6/24	7/15	21.0	35.1
Fort Yukon	817	1	6/14	7/18	34.0	24.1
Mouth Goodpaster River (Tanana River)	830	1	6/24	8/?	?	?
Above Eagle	1,070	2	6/22-28	8/9	45.0	23.1
Old Crow (Porcupine R.)	1,808	1	6/23	late July	?	?
Dawson	1,130	1	6/27	7/29	32.0	35.1
Mayo	1,310	1	6/19	8/1	43.0	30.1
Carmacks	1,366	5	6/23-7/4	7/18-8/20	40.3	33.1
Pelly Crossing (Pelly R.)	1,395	1	6/30	8/7	38.0	36.1
Lake Lebarge	1,530	1	7/1	8/21	51.0	30.1

TABLE (con't)

## MIGRATION RATES OF YUKON RIVER TAGGED KING SALMON BY AREA DURING 1968

Area of Recovery	Mileages Tagging Site	No. of Recoveries	Tagging Dates (Range)	Recovery Dates (Range)	Mean Days Out	Mean M Per D
<u>DOGFISH VILLAGE TAGGING SITE (Mile 227)</u>						
Paimiut	24	1	6/16	6/20	4.0	6.0
Above Paimiut	33	5	6/16-22	6/19-26	2.6	12.5
Above Holy Cross	56	1	6/18	6/29	11.0	5.1
Below Nulato	248	1	6/25	7/3	8.0	31.0
Rampart	536	3	6/17-25	7/5-15	19.7	27.2
<u>PAIMIUT TAGGING SITE (Mile 251)</u>						
Below Paimiut	-	1	7/1	7/7	6.0	-
Paimiut	-	1	6/30	7/4	4.0	-
Above Paimiut	10	1	7/8	7/9	1.0	10.0
Holy Cross	32	1	7/1	7/6	5.0	6.4
Nulato	233	1	7/1	7/14	13.0	16.4
Ruby	330	2	7/2-6	7/14-17	11.5	28.0
Kokrines	353	1	6/30	7/19	19.0	18.0
Tanana	444	1	7/8	7/23	15.0	29.0
Above Tanana	474	1	7/1	7/17	16.0	29.0

day while the migration rate of recoveries made in Canada were in excess of 30 miles per day. The maximum migration rate of a tagged king salmon recorded was 44.1 miles per day.

#### Recovery of King Salmon Classified as to Condition

In Table 5 the percentage of upstream recoveries of tagged kings in relation to condition at the time of release is shown. Unlike previous years, there was no appreciable difference in recovery rates between the three conditions. This was believed due to the probable difficulty in distinguishing the condition of tagged fish in the upriver tagging areas. At the mouth of the river it is relatively easy to determine the condition of king salmon that have immediately entered freshwater. At the tagging sites located 125 to 251 miles upriver, the kings are apparently better adjusted to freshwater and, consequently, it is difficult to observe differences in condition upon release.

#### Population Estimate Considerations

As discussed previously, the tag and recovery program experienced several difficulties that resulted in relatively few numbers of king salmon being tagged. A population estimate based on upriver subsistence and commercial fishery recoveries of the king salmon passing through the tagging areas is calculated below, utilizing a simple Peterson formula. The number of king salmon estimated to have passed through the tagging areas, 83,600 fish, and the calculated escapement of 62,033 are probably low due to errors resulting from limitations of the data.

TABLE 5

PERCENTAGE UPSTREAM RECOVERY FOR YUKON RIVER TAGGED  
KING SALMON CLASSIFIED AS TO CONDITION DURING 1968

Condition Classification	Number Tagged				Percentage Recovery			
	Ohogamiut	Dogfish Village	Paimiut	Total	Ohogamiut	Dogfish Village	Paimiut	Total
1	108	32	63	203	29.6	28.1	12.7	24.1
2	132	3	9	144	25.0	66.7	0	24.3
3	19	1	3	23	31.6	0	0	26.1
Unclassified	3	0	0	3	0	0	0	0
Totals	262	36	75	373	27.1	30.6	22.2	24.1

POPULATION ESTIMATION COMPUTATIONS, YUKON RIVER KING SALMON, 1968

	<u>Commercial Catch</u>	<u>Subsistence Catch</u>	<u>Total</u>
Subdistrict 334-10	79,543	2,277	81,820
Subdistrict 334-20	21,319	1,553	22,872
Subdistrict 334-30	4,543	4,086	8,629
Subdistrict 334-40	1,119	6,839	7,958
Yukon Territory	2,152	2,828	4,980
	<hr/>	<hr/>	<hr/>
TOTAL	108,676	17,583	126,259

Flat Island Test Fishing Catches = 831

Andreafsky River<sup>1/</sup> Aerial Survey Escapement Estimate (Minimum count) = 769

Estimated Numbers of Kings Passing Tagging Areas:

Number Tagged = 376

Subdistrict 334-30 and 334-40 and Yukon Territory

Subsistence and Commercial Catches = 21,567

Number of Recoveries<sup>2/</sup> = 97 91

$\hat{P}$  (Population estimate) =  $\frac{(376)(21,567)}{97 \ 91} = 83,600$   
89,111

Estimated Escapement Passed Tagging Areas:

Population estimate	83,600	89,111
<u>Upriver catches</u>	<u>-21,567</u>	<u>-21,567</u>
Estimated Escapement =	62,033	67,544

(5,511)

TOTAL ESTIMATE OF YUKON RIVER KING SALMON RUN:

Subdistrict 334-10 and 334-20 Subsistence & Commercial Catch:	104,692
Flat Island Test Fish Catch:	831
Andreafsky River Escapement Estimate:	769
Population Estimate Passed Tagging Areas:	<u>83,600</u>

TOTAL ESTIMATE OF RUN: 189,892 Kings

195,403

+6 = 195,409

<sup>1/</sup> Chulinak River, which is located downstream from Ohogamiut and receives a king run, was not surveyed.

<sup>2/</sup> Includes only tag recoveries made upriver from the tagging sites.



### Chum Salmon

A total of 2,495 chum salmon were captured with mainly 8-1/2 inch mesh set gill nets at the tagging sites and 591 (23.7 %) were tagged and released. In Appendix Table B the daily numbers of chum salmon captured, tagged and the number of recoveries by tagging date are shown. The numbers of captured, tagged and recovered chum salmon and the percentage tagged and recovered by tagging sites is summarized below in Table 6.

Table 6. 1968 Tagging Summary, Chum Salmon

	Number Captured	Number Tagged	Percent Tagged	Number Recovered	Percent Recovered
Ohogamiut	1,094	215	19.7	19	8.8
Dogfish Village	78	20	25.6	1	5.0
Paimiut	<u>1,323</u>	<u>356</u>	<u>26.9</u>	<u>25</u>	<u>7.0</u>
TOTAL	2,495	591	23.7	45	7.6

The overall recovery rate was 7.6 percent for all sites combined. Similar low recovery rates of Yukon River chum salmon captured for tagging with gill nets have occurred in other years (see p. 16 of 1967 Technical Report).

As a result of the small numbers of recoveries (45) a detailed analysis of the chum salmon data will not be undertaken except for some brief comments on distribution of recoveries by area, general run timing and migration rates.

#### Distribution of Recoveries by Area

Similar to the pattern of king salmon returns, most of the chum salmon recoveries were made in areas relatively close to the tagging sites (Table 7). The furthest upstream recovery was made at Tanana, a distance of 695 miles from the mouth.

#### General Run Timing

The first chum salmon capture occurred on June 14 at Ohogamiut. The peak of the chum run passed Ohogamiut during June 28 to July 2. At Paimiut the peak of the run occurred during July 5 to 11.

#### Migration Rates

As noted for king salmon, the migration rates for tagged chum salmon increased as the distance traveled upstream increased. The maximum migration

TABLE 7

## MIGRATION RATES OF YUKON RIVER TAGGED CHUM SALMON BY AREA DURING 1968

Area of Recovery	Mileages from Tagging Site	No. of Recoveries	Tagging Dates (Range)	Recovery Dates (Range)	Mean Days Out	Mean Miles Per Day
<u>OGAMIUT TAGGING SITE (Mile 185)</u>						
Ohogamiut	0	1	7/9	7/12	3.0	-
Russian Mission	28	3	7/1-4	7/5-8	4.3	6.5
Paimiut and vicinity	66-76	8	6/28-7/5	7/1-9	4.6	6.9
Holy Cross and vicinity	90-98	3	6/26-7/7	7/2-12	5.0	9.3
Anvik	132	2	6/29-7/1	7/6	6.0	22.0
Above Grayling	181	1	7/1	7/?	?	?
Nulato and vicinity	301	1	7/8	8/?	?	?
<u>GFISH VILLAGE TAGGING SITE (Mile 227)</u>						
Anvik	90	1	6/18	6/27	9.0	10.0
<u>IMIUT TAGGING SITE (Mile 251)</u>						
Below Paimiut	-	3	7/1-8	7/8-15	5.0	-
Paimiut and vicinity	0-10	9	7/1-8	7/4-10	1.4	5.2
Holy Cross and vicinity	30-32	5	7/1-8	7/3-31	7.4	4.3
Anvik	66	3	7/5-10	7/9-14	3.7	17.8
Grayling and vicinity	85-115	2	7/6-8	7/15-16	8.5	23.5
Kaltag	201	1	7/2	7/9	7.0	28.7
Below Nulato	221	1	7/3	7/20	17.0	13.0
Tanana	444	1	7/5	7/20	15.0	29.6

rate recorded of a tagged chum was 29.6 miles per day.

## DISCUSSION AND FUTURE PLANS

The 1968 tag and recovery project was hampered by several problems, some resulting from unfamiliarity with the Ohogamiut-Paimiut areas, that drastically affected the numbers of salmon captured and, subsequently, tagged. Even if these difficulties were overcome, it is felt that the present method of capturing salmon for tagging, set gill nets, is unsatisfactory. Of primary concern is the high mortality of gill net caught salmon which results in comparatively few being tagged. For example, only 37.3 percent of the kings and 23.7 percent of the chums captured with gill nets were tagged. Still to be evaluated is the extent of mortality of the tagged fish after release due to the capture, handling and tagging operation. It becomes apparent that another method of capturing relatively large numbers of salmon in suitable condition for tagging is needed.

During the 1969 field season the Department plans to investigate the use of large fishwheels that were successful years ago in the Columbia River king salmon commercial fishery. If this type of fishwheel proves feasible and if good fishing sites can be located, then it is believed that large numbers of king salmon in suitable condition for tagging can be obtained.

## SUMMARY

### King Salmon

1. In 1968 the Yukon River tag and recovery was transferred upriver to the Ohogamiut-Paimiut areas (Mile 185-251). Several problems were encountered that resulted in relatively small numbers of salmon being captured and tagged: e.g., high water, large amounts of driftwood, difficulty in locating suitable tagging sites, and development of adequate fishing methods.

2. A total of 1,007 kings were captured at the tagging sites with set gill nets and 376 (37.3 %) were tagged and released. Most of the king salmon (70 %) were tagged and released at the Ohogamiut site.

3. A total of 98 recoveries (26.1 %) were recovered by commercial and subsistence fishermen.

4. Tag recoveries were distributed along the entire Yukon River drainage. Most of the tag recoveries were made in the Russian Mission-Holy Cross area where a large amount of fishing effort is located relatively close to the tagging sites. A total of ten recoveries were made in the Yukon Territory.

The furthest upstream recovery was made at Lake Lebarge near Whitehorse, a distance of 1,715 miles from the mouth.

5. Similar to previous years, there was no apparent relationship between the distribution of upriver recoveries (above Mile 484) and the date of tagging. The distribution of tag recoveries upriver was dependent on the number of fish tagged.

6. The first king salmon was captured on June 5 at the Ohogamiut site. The main peak of the king run occurred on June 24-25 in the Ohogamiut-Paimiut area and is probably traceable to a peak in timing of the run at Flat Island near the mouth occurring on June 19-22.

7. In general, the migration rate of tagged king salmon increased as the distance traveled upstream increased. The maximum migration rate of a tagged king recorded was 44.1 miles per day.

8. Unlike previous years, there were no appreciable differences in percentage recovery rates of tagged king salmon in relation to condition upon release.

9. Although relatively small numbers of king salmon were tagged, a population estimate was calculated based on a simple Peterson formula. A total of 83,600 kings were estimated to have passed through the tagging areas. The total estimate of the Yukon River king salmon population was 189,892 fish.

#### Chum Salmon

1. A total of 2,495 chum salmon were captured with mainly 8-1/2 inch mesh set gill nets at the tagging sites. A total of 591 (23.7 %) were tagged and released.

2. Only 45 recoveries (7.6%) were made. Most of the recoveries were taken in areas relatively close to the tagging sites. The furthest upstream recovery was made at Tanana, a distance of 695 miles from the mouth.

3. The first chum salmon was captured on June 14 at Ohogamiut. The peak of the chum run in the Ohogamiut-Paimiut areas occurred during the period June 28 to July 11.

4. In general, the migration rate of tagged chum salmon increased as the distance traveled upstream increased. The maximum rate of travel for a tagged chum recorded was 29.6 miles per day.

NUMBERS OF YUKON RIVER KING SALMON  
TAGGED, CAPTURED AND RECOVERED DURING 1968

Date	OHOGAMIUT SITE			DOGFISH VILLAGE SITE			PAIMIUT SITE		
	Numbers Tagged	Numbers Untagged	Total Catch	Numbers Tagged	Numbers Untagged	Total Catch	Numbers Tagged	Numbers Untagged	Total Catch
6/4	0	0	0						
6/5	0	1	1						
6/6	0	1	1						
6/7	1	1	2						
6/8	0	0	0						
6/9	0	0	0	0	0	0			
6/10	1	1	2	0	0	0			
6/11	0	1	1	0	1	1			
6/12	0	0	0	0	0	0			
6/13	1	0	1	0	0	0			
6/14	1	5	6	0	0	0			
6/15	0	0	0	1	5	6			
6/16	4	5	9	5	7	12			
6/17	3	3	6	1	0	1			
6/18	0	3	3	3	5	8			
6/19	3	1	4	0	2	2			
6/20	4	4	8	1	3	4			
6/21	2	5	6	3	1	4			
6/22	4	5	9	6	11	17			
6/23	30	16	46	0	1	0			
6/24	94	74	168	0	1	1			
6/25	11	17	28	10	21	31			
6/26	3	7	10	5	7	12			

Date	COMBINED SITES			RECOVERIES OF TAGS OUT			
	Numbers Tagged	Numbers Untagged	Total Catch	Dogfish			Total
				Ohogamiut	Village	Paimiut	
6/4	0	0	0	0			0
6/5	0	1	1	0			0
6/6	0	1	1	0			0
6/7	1	1	2	1			1
6/8	0	0	0	0			0
6/9	0	0	0	0			1
6/10	1	1	2	0	0		0
6/11	0	2	2	0	0		0
6/12	0	0	0	0	0		0
6/13	1	0	1	1	0		1
6/14	1	5	6	1	0		1
6/15	1	5	6	0	0		0
6/16	9	12	21	3	2		5
6/17	4	3	7	2	1		3
6/18	3	8	11	0	1		1
6/19	3	3	6	2	0		2
6/20	5	7	12	3	1		4
6/21	5	6	11	1	2		3
6/22	10	16	26	2	2		4
6/23	30	16	46	10	0		10
6/24	94	75	169	27	0		27
6/25	21	38	59	2	3		5
6/26	8	14	22	3	0		3

# APPENDIX TABLE A

## NUMBERS OF YUKON RIVER KING SALMON TAGGED, CAPTURED AND RECOVERED DURING 1968 (con't)

Date	OHOGAMIUT SITE			DOGFISH VILLAGE SITE			PAINIUT SITE		
	Numbers Tagged	Numbers Untagged	Total Catch	Numbers Tagged	Numbers Untagged	Total Catch	Numbers Tagged	Numbers Untagged	Total Catch
6/27	8	13	21	1	2	3			
6/28	20	32	52	0	2	2			
6/29	14	41	55				0	0	0
6/30	12	19	31				24	85	109
7/1	10	12	22				18	22	40
7/2	6	10	16				5	10	15
7/3	2	8	10				3	9	12
7/4	7	11	18				1	5	6
7/5	7	18	25				6	12	18
7/6	2	7	9				3	9	12
7/7	2	3	5				8	17	25
7/8	0	2	2				3	9	12
7/9	2	3	5				3	10	13
7/10	1	1	2				2	11	13
7/11	0	2	2				1	12	13
7/12	3	6	9				0	8	8
7/13	0	4	4						
7/14	2	0	2						
7/15	2	1	3						
7/16	1	1	2						
Totals	263	344	607	36	68	104	77	219	296

Date	COMBINED SITES			RECOVERIES OF TAGS OUT <sup>1/</sup>			
	Numbers Tagged	Numbers Untagged	Total Catch	Ohogamiut	Dogfish Village	Painiut	Total
6/27	9	15	24	2	0		2
6/28	20	34	54	4			4
6/29	14	41	55	1		0	1
6/30	36	104	140	5		2	7
7/1	28	34	62	2		4	6
7/2	11	20	31	0		0	0
7/3	5	17	22	1		1	2
7/4	8	16	24	1		0	1
7/5	13	30	43	1		0	1
7/6	5	16	21	0		1	1
7/7	10	20	30	1		0	1
7/8	3	11	14	0		2	2
7/9	5	13	18	0		0	0
7/10	3	12	15	0		0	0
7/11	1	14	15	0		0	0
7/12	3	14	17	0		0	0
7/13	0	4	4	0			0
7/14	2	0	2	0			0
7/15	2	1	3	0			0
7/16	1	1	2	0			0
Totals	376	631	1,007	76(28.9)	12(33.3)	10(13.0)	98(26.1)

<sup>1/</sup> Figures in parenthesis represent recovery percentages of tags out.

# APPENDIX TABLE B

## NUMBERS OF YUKON RIVER CHUM SALMON TAGGED, CAPTURED AND RECOVERED DURING 1968

Date	OHOGAMIUT SITE			DOGFISH VILLAGE SITE			PAIMIUT SITE		
	Numbers Tagged	Numbers Untagged	Total Catch	Numbers Tagged	Numbers Untagged	Total Catch	Numbers Tagged	Numbers Untagged	Total Catch
6/1	0	0	0						
6/5	0	0	0						
6/6	0	0	0						
6/7	0	0	0						
6/8	0	0	0						
6/9	0	0	0	0	0	0			
6/10	0	0	0	0	0	0			
6/11	0	0	0	0	0	0			
6/12	0	0	0	0	0	0			
6/13	2	0	2	0	0	0			
6/14	1	4	5	0	0	0			
6/16	3	5	8	0	1	1			
		3	4	0	0	0			
6/18	4	6	10	4	3	7			
6/19	0	5	5	2	3	5			
6/20	0	6	6	1	0	1			
6/21	5	7	12	4	8	12			
6/22	2	11	13	1	8	9			
6/23	1	11	12	0	3	3			
24	8	16	24	1	7	8			
		33	38	3	3	6			
		31	39	4	11	15			

Date	COMBINED SITES			RECOVERIES OF TAGS OUT			
	Numbers Tagged	Numbers Untagged	Total Catch	Dogfish			Total
				Ohogamiut	Village	Paimiut	
6/4	0	0	0	0			0
6/5	0	0	0	0			0
6/6	0	0	0	0			0
6/7	0	0	0	0			0
6/8	0	0	0	0			0
6/9	0	0	0	0	0		0
6/10	0	0	0	0	0		0
6/11	0	0	0	0	0		0
6/12	0	0	0	0	0		0
6/13	0	0	0	0	0		0
6/14	2	0	2	0	0		0
6/15	1	4	5	0	0		0
6/16	3	6	9	0	0		0
6/17	1	3	4	0	0		0
6/18	8	9	17	0	1		1
6/19	2	8	10	0	0		0
6/20	1	6	7	0	0		0
6/21	9	15	24	0	0		0
6/22	3	19	22	0	0		0
6/23	1	14	15	0	0		0
6/24	9	23	32	0	0		0
6/25	8	36	44	0	0		0
6/26	12	42	54	1	0		1

# APPENDIX TABLE B

## NUMBERS OF YUKON RIVER CHUM SALMON TAGGED, CAPTURED AND RECOVERED DURING 1968 (con't)

Date	OHOGAMIUT SITE			DOGFISH VILLAGE SITE			PAIMIUT SITE		
	Numbers Tagged	Numbers Untagged	Total Catch	Numbers Tagged	Numbers Untagged	Total Catch	Numbers Tagged	Numbers Untagged	Total Catch
6/27	10	48	58	0	4	4			
6/28	16	68	84	0	7	7			
6/29	18	66	84						
6/30	24	99	123				9	59	68
7/1	30	75	105				19	70	89
7/2	11	60	71				16	38	54
7/3	8	44	52				14	37	51
7/4	12	45	57				34	91	125
7/5	13	38	51				42	65	107
7/6	6	47	53				23	84	107
7/7	8	33	41				50	136	186
7/8	4	19	23				78	109	187
7/9	4	26	30				26	94	120
7/10	2	14	16				22	88	110
7/11	3	19	22				18	46	64
7/12	1	7	8				5	50	55
7/13	3	12	15						
7/14	1	8	9						
7/15	1	5	6						
7/16	0	8	8						
T <sup>1</sup> ls	215	879	1,094	20	58	78	356	967	1,323

Date	COMBINED SITES			RECOVERIES OF TAGS OUT 1/			
	Numbers Tagged	Numbers Untagged	Total Catch	Ohogamiut	Dogfish Village	Paimiut	Total
6/27	10	52	62	0	0		0
6/28	16	75	91	2	0		2
6/29	18	66	84	2			2
6/30	33	158	191	1		0	1
7/1	49	145	194	4		3	7
7/2	27	98	125	2		2	4
7/3	22	81	103	0		3	3
7/4	46	136	182	3		1	4
7/5	55	103	158	1		6	7
7/6	29	131	160	0		2	2
7/7	58	169	227	1		1	2
7/8	82	128	210	1		5	6
7/9	30	120	150	1		0	1
7/10	24	102	126	0		1	1
7/11	21	65	86	0		1	1
7/12	6	57	63	0		0	0
7/13	3	12	15	0			0
7/14	1	8	9	0			0
7/15	1	5	6	0			0
7/16	0	8	8	0			0
Totals	591	1,904	2,495	19(8.8)	1(5.0)	25(7.0)	45(7.6)

1/ Figures in parenthesis represent recovery percentage of tags out.